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# **A Fuzzy *c*-means Cluster Analysis to Explain SMEs' Export Propensity: Evidence from North-Africa**

## **Abstract**

**Purpose:** This paper analyses the determinants of Small and Medium Enterprises' (SMEs) propensity to export using data from a North African country, namely; Algeria. Drawing on the extended Resource Based View, the study examines the role of firms' resources and capabilities in explaining the probability to export.

**Design/methodology/approach:** The study employs the nascent fuzzy *c*-means clustering technique to analyse a sample of 208 manufacturing Algerian SMEs. The sample included both established and potential exporters operating across various sectors. A combination of online and face-to-face techniques was used to collect the data.

**Findings:** While a preliminary analysis established the existence of five clusters exhibiting different levels of resources, further discernment of these clusters has shown significant variances in relation to export propensity.

**Practical implications:** The findings provide a more comprehensive insight on the critical resources shaping SMEs' internationalisation in the North-African context. The paper holds important implications for export promotion policy in this area.

**Originality/value:** The study makes a twofold contribution. First, the use of the fuzzy *c*-means clustering technique to capture the joint influence of discrete resources and capabilities on SMEs' export propensity constitutes a methodological contribution. Second, being the first study bringing evidence on SMEs' internationalisation from the largest country in the African continent, in terms of landmass, constitutes an important contextual contribution.

**Key Words:** Algeria, Export propensity, Cluster Analysis, Resources and Capabilities, SMEs.

**Paper Type:** Research paper

## Introduction

Small business internationalisation has received an increasing attention in the international entrepreneurship literature. Particularly, the resource-factors influencing the internationalisation of small and medium sized enterprises (SMEs) have been the focus of numerous past studies (Brush *et al.*, 2002; Dhanaraj and Beamish, 2003; Belesca-Spasova *et al.*, 2012; Díez-Vial and Fernández-Olmos, 2013; Conti *et al.*, 2014; Denicolai *et al.*, 2014; Pickernell *et al.*, 2016). Identifying such resources is considered crucial for the development and improvement of the so-called export promotion programmes, as these are typically designed to act as a resource supplement for SMEs (as evidenced in Shamsuddoha *et al.*, 2009; Leonidou *et al.*, 2011, Haddoud *et al.*, 2017 and Wang *et al.*, 2017).

Contrastingly, such a surge in the empirical literature is less evident with respect to SMEs evolving in developing regions (Matanda *et al.*, 2016; Cahen *et al.*, 2016; Bianchi *et al.*, 2017; Paul *et al.*, 2017). Despite their increasing participation in the international business arena, related research on African SMEs remains scarce (Boso *et al.*, 2016; Misati *et al.*, 2017). As a consequence, policy makers and export promotion organisations in this part of the world have often relied on findings obtained from advanced countries' datasets. Arguably, the relevance of such findings to the African context is yet to be determined (Boso *et al.*, 2012; Robson and Freel, 2008; Bianchi *et al.*, 2017). This is mainly due to the fact that African SMEs are affected by unique factors emanating from context-specific institutional and environmental pressures (Boso *et al.*, 2016). It is acknowledged that different contexts would lead to different internationalisation behaviours (Andersson and Floren, 2008).

Against this, the current paper examines the role of discrete resources and capabilities in increasing SMEs' propensity to export, within the Algerian context. Algeria is an increasingly important player in the global world, enjoying a strategic geographical position bridging Africa, Europe and the Middle-East. Being in such a location makes the export potential of Algerian SMEs considerable and likely to be an important driver of the regional development. Despite a few studies examining the Algerian context in various management-related disciplines (Mellahi and Frynas, 2013; Branine *et al.*, 2008; Ramdani *et al.*, 2014), in the internationalisation literature, this study represents the first study providing evidence from this country, hence providing an important contextual contribution. In Ibeh *et al.*'s (2012) recent review on the African internationalisation, only two studies looking at North African firms were published between 1995 and 2011 (Khemakham (2010) for Tunisia and Fafchamp *et al.* (2007) for Morocco), whereas, none focused on Algerian SMEs.

Furthermore, going beyond the contextual contribution, the present study applies a novel fuzzy *c*-means clustering technique (Hagen *et al.*, 2012; McDermott *et al.*, 2013) to explain SMEs' export propensity. While most previous studies identified the key resources using multivariate analysis techniques (e.g. Javalgi and Todd, 2011; Beleska-Spasova *et al.*, 2012; Ganotakis and Love, 2012; Serra *et al.*, 2012), this study uses the fuzzy *c*-means clustering approach to identify the joint influence of these resources, that is more likely to take place in a real world. Export behaviour is often a complex phenomenon for which fuzzy based techniques are more likely to capture such complexity (Woodside, 2013). This constitutes a key methodological contribution, answering Terjesen *et al.*'s (2016) call for using more diverse and sophisticated analytical techniques to address international entrepreneurship issues.

Employing a clustering approach would be useful to SMEs and public export promotion bodies in providing multiple typologies of relevant resources to achieve higher export entry rates. Despite few studies adopting a cluster analysis using a *k*-means approach (Namiki, 1988; Bijmolt and Zwart, 1994; Cahen *et al.*, 2017), the use of a fuzzy *c*-means based approach is still scarce. The fuzzy clustering approach against a more traditional 'crisp' non-fuzzy approach argued here, offers a more nuanced form of analysis (based on the clustering data coming from factor analysis established factor scores themselves elucidating grades of opinion – see later).

Following on from the introduction, the next section provides an overview of the research context. Thereafter, a section reviewing the literature on the resource-factors affecting firms' internationalisation is outlined. This is followed by a description of the methods, data collection and analysis techniques. Finally, results are discussed, and conclusions drawn.

### **The North African context: Algeria**

In terms of landmass, Algeria is the largest African country. Like many of the African nations, Algeria is a country characterised by a heavy dependence on natural resources such as oil and gas. Hydrocarbon exports account for over 95% of the total export earnings (Global Insight, 2014). In contrast, non-oil exports are negligible and only represent around 4% of the total exports (MDIP, 2013). Due to the recent continuous decline in oil prices, the country is urged to reduce this imbalance, as the long term growth of the economy will depend on the Government's ability to boost its non-oil foreign trade (IMF, 2011; World Bank, 2014).

Conscious of such role, the Algerian Government has increased its commitment through extensive investments on a range of export promotion programmes in order to increase the number of exporting SMEs (Algerie Press Service, 2016). Nonetheless, despite these

efforts, the total number exporters remains minimal. The latest estimations evaluate their number as not exceeding 520 companies (The Algerian Chamber of Commerce Database, 2016). It is believed that this lack of effectiveness could be primarily attributed to inefficient targeting. In this vein, identifying the relevant resources driving SMEs' to successfully enter export markets would be a good step forward in increasing the efficiency of the government export promotion organisation through better targeting (Haddoud *et al.*, 2017).

### **Firm resources and internationalisation**

The shift in the internationalisation literature from the stage approach, which considers firms' foreign operations as an incremental process conditioned by perceived psychic distance (Johanson and Valhne, 1977), to the international entrepreneurship approach, which argues that firms' internationalisation is conditioned by their resource stock, has emphasised more than ever before the role of firms' assets in driving international activities (Brush *et al.*, 2002). Recent literature provided evidence that barriers preventing SMEs from entering foreign markets are generally due to the lack of both internal and external resources (Neupert *et al.*, 2006; Tesfom and Lutz, 2006; Villar *et al.*, 2014; Brouthers *et al.*, 2015). Thus, a key difference between domestic and international SMEs resides in their resource availability (Brush *et al.*, 2002). In this vein, and drawing on the extended resource based view (Lavie, 2006), which argues that firms' competitive advantage is driven by both internal and external resource bundles, the export literature has been developing successful theoretical models to explain SMEs' internationalisation behaviour (Beleska-Spasova *et al.*, 2012; Boehe, 2013; Kembro *et al.*, 2014; Hinterhuber, 2013; Spring and Araujo, 2014).

In an international context, the export literature has broadly clustered the resource factors into assets related to the owner/manager's, the organisation and the business networks (Brush *et al.*, 2002; Beleska-Spasova *et al.*, 2012). In this study, the resource bundles have been divided into firms' managerial resources, relational resources, marketing capabilities and innovative capabilities. This classification considers the distinction between a resource (what the firm has) and a capability (what the firm does) (Kaleka, 2002). The categorisation is also partly adapted from Beleska-Spasova *et al.*'s (2012) classification of firms' resource driving export performance. The study argues that the availability of such resource bundles influence SMEs' decision to enter export markets (Bloodgood *et al.*, 1996).

In an SME context, the owner/manager plays a central role in influencing firms' internationalisation (Miesenbock, 1988). The export literature has dedicated significant attention to study the managerial resources as precursors to export behaviour (Sousa *et al.*,

2008). Such attention could be explained by the influence of psychic distance on firms' internationalisation, as argued by the Uppsala School (Johanson and Vahlne, 1977). According to this perspective, SMEs' internationalisation is influenced by the decision maker's experience and knowledge towards export market. Hence, factors such as the lack of foreign knowledge could prevent firms from entering international markets (Fillis, 2002). Similarly, internal capabilities are considered as important determinants of export behaviour (Ibeh, 2003). Innovative and marketing capabilities are frequently cited amongst the factors leading firms to enter foreign markets (Dhanaraj and Beamish, 2003; Ibeh, 2003; Serra *et al.*, 2012). Such capabilities would allow SMEs to develop international competitive advantages which would encourage them to enter international markets.

Finally, firms' internationalisation is also considerably affected by tangible and intangible resources that are obtained through collaborative activities with peer-firms (Wright *et al.*, 2007). Inter-firms' alliances are often the synonym of resource and capability development (Boehe, 2013). By definition, network resources refer to the external resources owned by peer firms and which can be accessed through cooperation (Gulati, 2007). Based on the network approach of internationalisation (Coviello and Munro, 1997), SMEs are able to enter foreign markets through their networks. Such networks constitute the means to overcome the liability of foreignness that prevent SMEs from entering export markets. The following reviews the resource determinants of SMEs' export propensity in further details.

#### *Export-oriented managerial resources*

The recognition and the influence of an export stimulus are closely related to the management's knowledge, attitudes and motivation toward internationalisation (Reid, 1981). The export literature has commonly included the manager's knowledge and experience as resource antecedents of export propensity. In both developing and developed countries, the manager's lack of information and knowledge about exporting and export markets was found to be among the most significant factors stopping resource-constrained firms from embarking on export activities (Rutihinda, 2008; Pinho and Martins, 2010; Shih and Wickramaesekera, 2011; Al-Hyari *et al.*, 2012). The lack of knowledge increases the uncertainties characterising the turbulent export markets (Pinho and Martins, 2010; Al-Hyari *et al.*, 2012; Uner *et al.*, 2013). Reliable and updated information is essential to assist managers' decision-making tasks in export markets. Export knowledge gives the decision maker more flexibility and allows them to have a quicker understanding of export problems and react more effectively (Nemkova *et al.*, 2012). Equally, internationally experienced management teams are more likely to benefit

from more strategic partners and are quicker in obtaining foreign sales (Reuber and Eileen, 1997). Evidence from developing countries such as Nigeria revealed that having a past foreign business experience positively influenced decision makers to go abroad and hence increase their propensity to export (Ibeh, 2003).

#### *Innovative capabilities*

Several studies found a significant and positive association between innovation, technology intensity and the propensity to export (Reid, 1982; Nassimbeni, 2001; Dhanaraj and Beamish, 2003; Ibeh, 2003; Van Beveren and Vandenbussche, 2010; Serra *et al.*, 2012). Innovative capabilities constitutes a competitive advantage, which can make the difference in international markets and enhance the export potential (Nassimbeni, 2001; Roper and Love, 2002; Ibeh, 2003; Serra *et al.*, 2012). Innovative capabilities allow SMEs to develop new products at a reduced cost that would enable them to compete internationally. The quality, uniqueness and adaptability of the product to international markets are seen as important factors for exporting. In this vein, Yang *et al.* (2004) confirmed that innovative activities (through R&D variables) positively influence the SMEs' export propensity. Similarly, Van Beveren and Vandenbussche (2010) suggested that both product and process innovation increase firms' export propensity.

#### *Marketing capabilities*

Based on the Resource Based View (RBV), marketing capabilities utilised during the marketing mix processes could be rare, valuable, non-substitutable, and inimitable, and are likely to provide firms with an international competitive advantage that can enhance their internationalisation (Vorhies and Morgan, 2005; Morgan *et al.*, 2012). Marketing capabilities constitute a source of cost-efficiency and branding advantages which would enhance firms' competitiveness in international markets (Zou *et al.*, 2003). However, empirical studies on export entry have underestimated the importance of the firms' competencies (Ibeh, 2003). A few studies revealed that marketing competencies including informational (Reid, 1984), pricing (Tzocas *et al.*, 2000), and advertising capabilities (Serra *et al.*, 2012) were amongst the determinants of firms' export propensity. In fact, firms focusing on strategic export pricing are more stimulated to enter export markets due to the opportunities of increasing the profit margin through foreign sales (Tzocas *et al.*, 2000). Similarly, firms with strong advertising capabilities (locally) are more likely to enter export markets through unsolicited foreign orders.

#### *Relational resources*

According to Lavie (2006), relational resources are the set of resources emerging from the SMEs' relationships and collaboration with peer firms and business partners. Local collaboration reflects the degree of cooperation between the firm and the surrounding local businesses. In this respect, several studies have confirmed the positive link between local collaboration and export propensity (Elis and Pecotish, 2001; Nassimbeni, 2001; Nemkova *et al.*, 2012; Boehe, 2013; Gashi *et al.*, 2014). Firms' decision and attitude to exporting are often influenced by other local firms' export activities and strategies (Karlsson *et al.*, 2014). Firms can benefit greatly from valuable exchange of information which would in turn positively influence the decision maker's attitude toward exporting (Wiedersheim-Paul *et al.*, 1978). In a qualitative study, Elis and Pecotish (2001) found that four out of five interviewed firms acknowledged that local networks considerably influenced their decision to start export activities. Likewise, memberships in industry associations affect firms' export propensity by increasing their local reachability (Boehe, 2013).

Overall, the empirical export literature confirms the importance of SMEs' resource bundles in enhancing export entry. In particular, it can be acknowledged that resources related to the decision makers' (managerial resources) and to the SMEs' external network (relational resources), as well as both innovative and marketing capabilities, are likely to enhance SMEs' export entry. Thus employing a comprehensive approach, this study examines the influence of four distinct categories of firms' resources on their likelihood to become exporters (export propensity). In so doing, the study adopts a novel fuzzy *c*-means cluster analysis approach and seeks to identify the joint influence of such factors in increasing SMEs' export propensity. Therefore, since no existing empirical evidence has explicitly tested such combinations, the authors abstain from generating hypotheses. The identification of these combinations will be data driven through the fuzzy *c*-means clustering technique. In fact, the use of hypotheses is atypical with cluster analysis (McDermott *et al.*, 2013).

## **Methods**

The study surveyed Algerian non-exporting (with an export potential) and exporting manufacturing SMEs. In this study, SMEs are defined as firms employing less than 500 employees (Dhanaraj and Beamish, 2003; Wilkinson and Brouthers, 2006; Rutihinda, 2008). This threshold is generally adopted to distinguish firms that are likely to have the potential to enter export (Haddoud *et al.*, 2017). The sampling frame for this study was gathered using databases provided by ALGEX, the main export promotion organisation in Algeria, as well as the Algerian Chamber of Commerce (Nancy *et al.*, 2009). In these databases, both established



and potential exporters are listed. It is worth noting that, to enhance its relevance, the present study mainly focuses on non-exporters with an export potential. To increase the response rate the researchers used a mix of online, postal and face to face (mainly in trade fairs) techniques to distribute the questionnaires. The survey targetted the owner/manager or the export manager (if existing) as these constitute the most relevant source of information (Sousa *et al.*, 2008).

The study returned 277 responses, from which 208 had complete data and were able to be included in the factor analysis employed in this study. This is considered as highly representative as according to recent statistics, the number of exporters in Algeria does not go beyond 520 companies (The Algerian Chamber of Commerce Database, 2016). Similarly, the number of potential exporters throughout the whole country accounts for approximately 1200 firms (LaTribune, 2015). To test for non-response bias, the study followed Armstrong and Overton's (1977) extrapolation method using the t-test technique in SPSS to compare the means of 30 late respondents (representing non-respondents) with 30 early respondents using a randomly selected 15 items (Kalafsky, 2004; Kaleka, 2012; Ketkar *et al.*, 2012). The difference between all the considered items was statistically non-significant, which leads to the conclusion that no major non-response bias exists in the sample. The sample characteristics, firm's size, firm's age and firm's export status, are presented in Table 1.

**Table 1:**

Samples' Characteristics

<b>Characteristics</b>	<b>Percentages (%)</b>
<b>Firms' Size</b>	
Less than 10	16.2
10 - 50	28.5
51 - 250	32.1
251 - 500	21.3
<b>Firms' Age</b>	
Less than 2 Years	7.9
2 - 10 Years	22.7
11 - 25 Years	37.2
26 -50 Years	20.2
Over 50 Years	6.1
<b>Firms' Export Status</b>	
Non-Exporters	65
Exporters	35

## Measurement

*Export propensity*

Existing research on exporting has investigated the factors that influence whether a firm exports or not, this is known as the propensity to export (Javalgi *et al.*, 2000; Obben and Magagula, 2003; Orser *et al.*, 2010; Densil, 2011; Serra *et al.*, 2012; Boehe, 2013). Export propensity is widely used to capture the probability to export. The premise behind this instrument is that factors which are significantly higher in exporters than in non-exporters would constitute indicators of the elements needed to motivate and enable non-exporters to begin exporting (Atuahene-Gima, 1995). Hence, following the abovementioned studies, this study measures export propensity using a dummy variable where exporters are coded 1 and non-exporters are coded 0. A company would be qualified as exporter if the latter has exported within the last five years (see Appendix A for further details on research instruments).

### *SMEs' resources and capabilities*

Following previous categorisations, the study included the following resources and capabilities: export-oriented managerial resources, relational resources, marketing capabilities and innovative capabilities. The export literature considers the entrepreneur's capital as a valuable resource that can enhance SMEs' internationalisation (Lafuente *et al.*, 2015). In this vein, managerial resources refer to the set attributes associated to the firms' decision maker(s). In the present study, these attributes comprised the managers' export knowledge and international experience as managerial resource attributes affecting firms' export propoensity. The inclusion of such resource factors was based on Reid's (1981) early suggestion that the management's knowledge and experience play a significant role in encouraging the decision maker to start exporting. According to Stoian and Rialp (2010), these factors are amongst the most studied managerial attributes in the export literature. Appendix A shows the measures used to assess these attributes.

Relational resources refer to the set of external resources obtained through collaboration with peer firms (Welch *et al.*, 1998; Lavie, 2006). In this study, relational resources were measured through assessing the relationship quality firms have with peer firms. Here, the premise is that long-term and high quality relationships will likely lead to cooperation and collaboration which wold then give firms access to additonal external resources. This was confirmed by Pinho and de Sá (2013) through an empirical study where the relationship quality led to commitment and cooperation. Measuring relationship quality was done using Lages *et al.*'s (2005) RELQUAL (relationship quality) measure. This measure could be utilised to assess the relationship quality between different parties. It includes four dimensions namely; the amount of information sharing, communication quality, long-term orientation and

satisfaction with relationship. According to Lages *et al.* (2005), information sharing and intensive communication amongst firms would lead to long-term goal and risk sharing behaviours, which would eventually lead to higher performance. Such collaborative behaviours would allow the firm to access valuable resources (Stoian *et al.*, 2016) that are likely to enhance international competitiveness (Wilkinson *et al.*, 2000).

Marketing capabilities included pricing, informational and advertising capabilities. To measure pricing capabilities, the study used items tested in several previous studies (Zou *et al.*, 2003; Vorhies and Morgan, 2005; Morgan *et al.*, 2009; Morgan *et al.*, 2012). The items covered the abilities of the company in communicating prices, responding to customers' needs and offering competitive deals. As for advertising capabilities, these were measured using items adapted from Zou *et al.*'s (2003) and Morgan *et al.*'s (2012) studies. These items assess the ability of the firm on developing effective promotional activities. As for informational capabilities, these were assessed using items adapted from previous studies (Kaleka, 2002; Morgan *et al.*, 2006; Leonidou *et al.*, 2011). These items evaluate the firms' capability in gathering market information, identifying potential customers and monitoring competition. Details about the measurement used to assess these dimensions are included in Appendix A. Here, the respondents were asked to rate their firm's export marketing capabilities compared to their major competitors in terms of pricing, information gathering and advertising competencies. The items were measured on a five-point Likert scale ranging from "much worse than competitors" to "much better than competitors" (Morgan *et al.*, 2012).

Lastly, innovative capabilities included R&D related activities and innovation outputs (Kim and Hemmert, 2016). To measure this, the study used a perception based scale measuring the R&D activities, the number of patents owned by the firm alongside the extent to which firms are adopting both process and product innovations (Knight, 2001; Pla-Barber and Alegre, 2007; Leonidou *et al.*, 2011). The proposed items are developed from Leonidou *et al.*'s (2001) study; these are measured on a five-point Likert scale ranging from "strongly disagree" to "strongly agree". All items are presented in Appendix A.

### *Exploratory factor analysis*

To validate the proposed categorisation, an exploratory factor analysis (EFA) was conducted. The EFA was applied following principal component factor analysis with Varimax rotation (McDermott *et al.*, 2012). The Kaiser-Meyer-Olkin value was .89, exceeding the recommended value of .6 (Kaiser, 1970; 1974) while the Bartlett's Test of Sphericity was significant at 0.1%, hence supporting the factorability of the correlation matrix (Pallant, 2013).

Based on the Scree plot, four components have emerged from the principal components analysis, labelled as Marketing Capabilities, Relational Resources, Managerial Resources, and Innovative Capabilities (see Appendix B). These accounted for 60.33% of the total variances.

The Cronbach's Alpha for these factors was as follow: Managerial resources ( $\alpha=0.90$ ); Relational resources ( $\alpha=0.92$ ); Marketing capabilities ( $\alpha=0.94$ ); Innovative capabilities ( $\alpha=0.81$ ). Appendix B shows the factors' loadings. The dropped items due to low loadings are highlighted in appendix A. In short, the obtained categorisation is to some extent in line with previous ones yet with a few differences. For example, while Brush *et al.* (2012) added financial resources (in terms of debt, equity and profitability), Belesca-Spasova *et al.* (2012), considered knowledge-based resources as a separate construct. The study omits financial resources due to the sensitive nature of such data amongst Algerian firms. Researchers in Algeria have no access to firm-level data, whereas the few objective data available are difficult to verify (Ramdani *et al.*, 2014). Nonetheless, based on growing empirical evidence, the present study included marketing capabilities as a driver to export propensity.

## Analysis

### *Cluster analysis of the resource-factors*

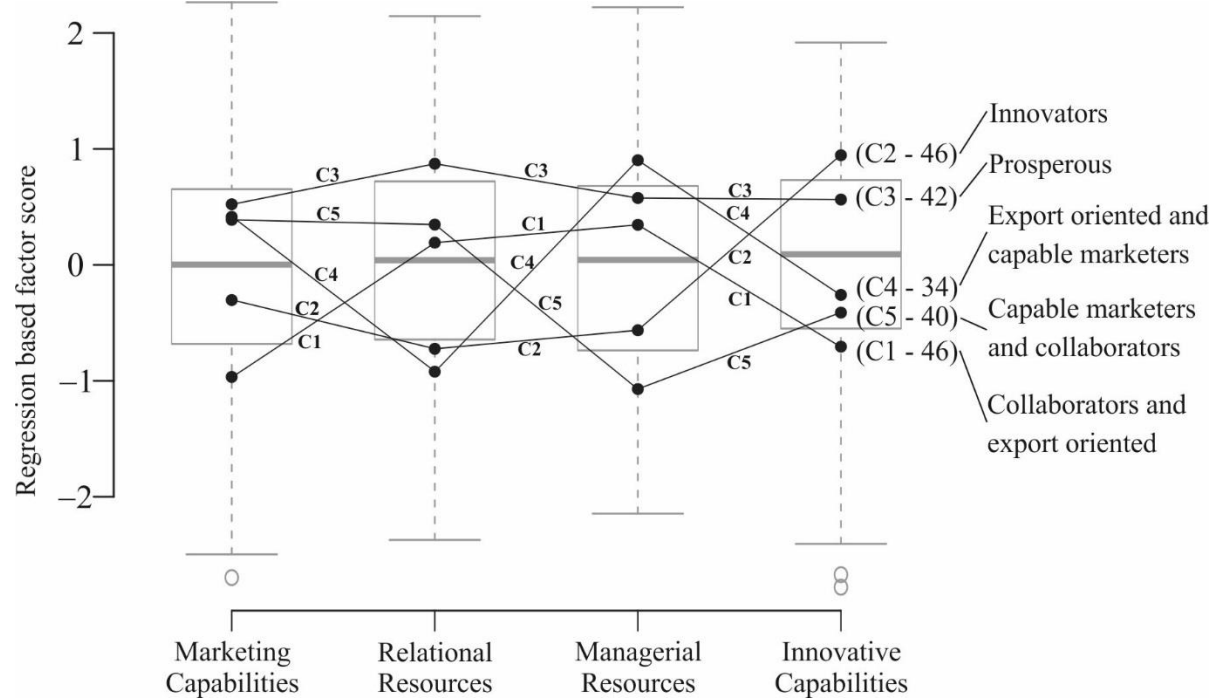
This section undertakes a series of cluster analyses of the established four factors, describing determinants of export propensity for the considered 208 firms, across Algeria. The nascent fuzzy *c*-means technique (Bezdek, 1980; 1981) is employed in this study, a development of *k*-means (MacQueen, 1967; Kanungo *et al.*, 2002), which allows objects to have degrees of association (membership) to individual clusters. This separation in what happens when employing fuzzy clustering and 'crisp' non-fuzzy clustering is pertinent in this analysis. Given the clustering is prevalent on the factor scores from factor analysis, which are each over continuous scales exhibiting themselves grades of opinion on certain factor based terms, when clustering the resultant cluster membership should be encompassing of this grades of opinion (McDermott *et al.*, 2013), hence preferment to fuzzy clustering.

Fuzzy clustering is particularly relevant when investigating firms' resources. Companies are more likely to display varied combinations of resource levels, and therefore, the fuzzy cluster analysis is performed on the assumption that each SME will be associated, to varying degrees, with different resource based clusters. In this regard, cluster solutions were provisionally investigated with three, up to six clusters, with theoretical defence arguments, as

well as granularity of cluster case membership suggesting the five cluster solution was appropriate for the analysis here (see Andrews *et al.*, 2010; 2016, McDermott *et al.*, 2013).

With the five-cluster solution established, constituent cluster factor means were found by grouping respondents to clusters based on majority association and taking the means of their values, for each cluster, over the different factors. Comparison of these constituent cluster factor means enables us to evaluate the ability of the clustering process to discern types of respondent, see Figure 1.

**Figure 1.**  
Five cluster solution based on fuzzy c-means analysis



In Figure 1, the individual cluster factor means are shown as points, with those associated with the same cluster joined by solid lines. Box plots are included, which show the spread of the factor values amongst the 208 respondents across each factor. These graphical and statistical findings allow us to consider the typologies of companies within each cluster, from Figure 1, next described:

- The first cluster (C1) includes 46 companies that exhibit high relational and export-related managerial resources. As for the remaining two capabilities, the companies within this cluster show the lowest levels in each of these. Therefore, the study labels this cluster as “Collaborators and export oriented”.

- The second cluster (C2) includes 46 firms that are characterised by high innovative capabilities yet score relatively low in the remaining resource factors. Hence, the study refers to these as “Innovators”.
- The third cluster (C3) comprises 42 firms which exhibit relatively high levels across all resources and capabilities. These are labelled as “Prosperous”.
- The fourth cluster (C4) includes 34 firms that are distinguished with relatively high levels of export-related managerial resources and marketing capabilities. The study labels these firms as “Export oriented and capable marketers”.
- The fifth cluster (C5) has 40 firms which exhibit high level of marketing capabilities and relational resources. These are called “Capable marketers and collaborators”.

With the five-cluster solution briefly described, in terms of typologies of the clusters, the study now considers the relationships between these clusters and export propensity.

#### *Analysis of export propensity*

This next section further considers the cluster analysis undertaken, in terms of the five cluster solutions established, using fuzzy *c*-means clustering. Beyond an understanding of the actual established clusters, in terms of the prescribed typologies of firms presented in respect to individual clusters, how these clusters of companies compare against export propensity is next considered.

This is an important issue when considering clustering cases. That is, the clustering attained must be interpreted and validated, to ensure that it is theoretically and practically meaningful (Frayley and Raftery, 1998). This meaningfulness (validation) should take both the consideration of qualitative arguments (Frayley and Raftery, 1998), as well as based on statistical analysis (Ketchen and Shook, 1996). Both the qualitative and statistical considerations of validation are considered here in respect to export propensity, not used in the clustering process, associated with the considered companies.

As in the elucidation of the factors used to cluster the firms, here both statistical and graphical elucidation of export propensity and the five-cluster solutions found using fuzzy *c*-means, see Figure 2. Since the export propensity is described by each SME in terms of a binary variable (0-1), the statistical elucidation is based on Chi-squared test and the graphical elucidation is based on the percentages of SMEs in each cluster which stated they had or didn't have export propensity. The results show a statistical difference between firms' export propensity across the different clusters ( $X^2(4, N = 208) = 56.292, p = 0.000 < .05$ ).

**Figure 2.**

Bar chart based breakdown of respondents in each cluster based on export propensity (including a statistical pairwise comparisons of clusters)

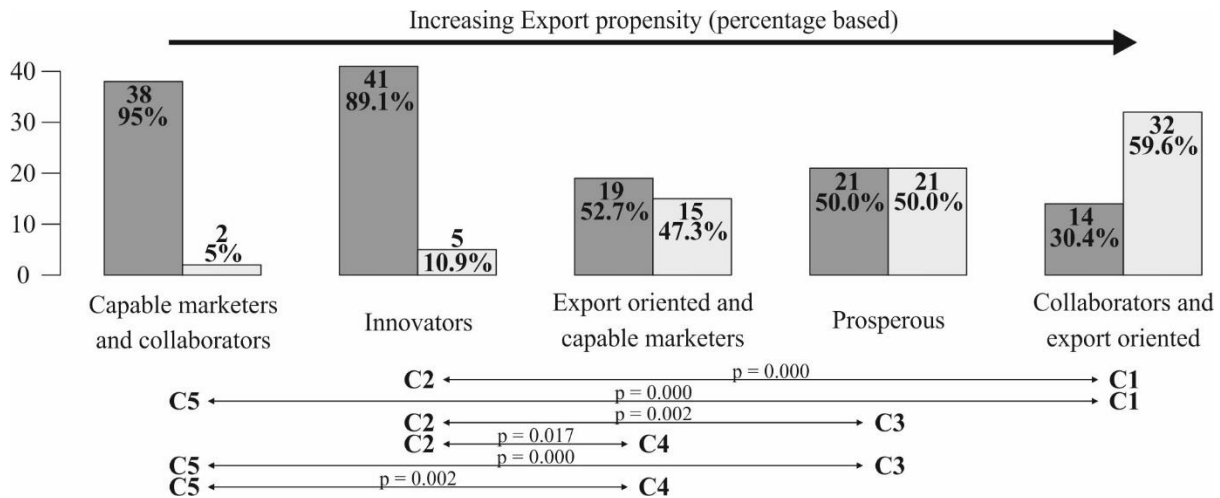


Figure 2 (bar chart, top part), graphically shows the variations in the cluster associations of respondents (based on majority association), to export propensity formulated on the percentage in each cluster which reported they were (light grey shaded bars) or were not (dark grey shaded bars) exporters.

Moving left to right in terms of increasing export propensity, and noting the interpretations of the clusters C1 to C5 given previously (C1 - Collaborators and export oriented, C2 - Innovators, C3 - Prosperous, C4 - Export oriented and capable marketers and C5 - Capable marketers and collaborators), the cluster with the highest proportion of exporters is the “Collaborators and export oriented” with 59.6%. This is followed by the “Prosperous” cluster with 50% and the “Export oriented and capable marketers” with 47.3%. In contrast, the clusters with the least proportion of export propensity are the “Capable marketers and collaborators” with only 5% of SMEs suggesting export propensity and the “Innovators” with 10.9% of exporters.

In statistic terms, Figure 2 (horizontal line, bottom part) graphically elucidates the cluster to cluster comparisons of different export propensity levels. Moreover, using pairwise comparisons, including Bonferroni p-value adjustment (see Beasley and Schumacker, 1995), the lines and pairs of cluster labels shown – identify those pairs of clusters which are statistically different in export propensity terms at the 5% significance level (see  $p$  values also shown – non-statistically different pairs of clusters are not shown). Inspection of these lines illustrates a clear divide between two groups of clusters, namely low export propensity C2, C5, and high export propensity C1, C3 and C4. These results are next discussed.

## Discussion

The fuzzy clustering analysis established five resource clusters. These clusters distinguished the SMEs in relation to the levels of their resources and capabilities. The clusters comprised of firms with high export-related managerial and relational resources (Collaborators and export oriented - C1), high innovative capabilities (Innovators - C2), high marketing capabilities and relational resources (Capable marketers and collaborators - C5), high export-related managerial resources and marketing capabilities (Export oriented and capable marketers - C4) and lastly high levels of resources and capabilities across the four sets (Prosperous - C3).

More importantly, the study identified that these clusters differ significantly in terms of export propensity. The pairwise comparison has outlined clear differences between clusters involving managerial resources and the ones missing such assets. Therefore, the possession of certain resources and capabilities was found to outperform others. Overall, it was established that clusters possessing high export-oriented managerial resources (Export oriented, Export oriented and capable marketers, and Prosperous) were highly likely to include a high proportion of exporting SMEs. Alternatively, with a low level of export-oriented managerial resources, SMEs with assets comprising marketing and innovative capabilities are more likely to include a high proportion of non-exporters. As for relational resources, these would only increase the share of exporters when coupled with additional resources and capabilities. SMEs possessing high relational resources and marketing capabilities had a low proportion of non-exporters, whereas SMEs with high relational resources and export-oriented managerial assets comprised a high proportion of exporters.

In considering the findings above, it is suggested that SMEs possessing higher levels of export-oriented managerial resources and relational resources are more likely to export. This goes in line with the extant literature. Managers equipped with relevant export knowledge and experience, and characterised by a positive perception towards exporting are likely to overcome uncertainties associated to international markets (Casillas *et al.*, 2015). The influence of the managerial attributes on SMEs' export propensity reflects the Uppsala approach to firms' internationalisation where the latter depends highly on the decision maker's knowledge and attitudes towards international activities (underlined by the psychic distance concept) (Johanson and Vahlne, 1977).

Regarding the influence of relational resources, early claims have acknowledged the importance of such resources (mainly through information exchange) in driving SMEs to enter export markets, a phenomenon known as contagion transmission (Wiedersheim-Paul *et al.*,



1978). The firm's decision to export is a process often considerably influenced by other peer firms. This is particularly relevant in highly collectivist societies such as the Algerian one (Ramdani *et al.*, 2014). The export decision becomes the resultant of a process of knowledge and experience sharing amongst firms (Bonaccorsi, 1992). Furthermore, an access to such relational resources may also be synonymous of reduced sunk costs (Yi and Wang, 2012) and increased reachability (Boehe, 2013).

However, it is important to note that in the present study, such a positive role was conditioned by joint the presence of export oriented managerial and relational resources. In fact, in accordance with the extended RBV, it could be argued relational resources per se would not be sufficient to achieve a competitive advantage. This is due to the fact that such shared resources are generally lacking uniqueness, which, according to the RBV principle, is an important requirement to achieve a competitive advantage (Barney, 1991). This could be offset by managers' unique expertise, experience and knowledge.

Contrastingly, the study reveals that marketing and innovative capabilities are unlikely to enhance SMEs' export propensity. Such findings are not consistent with previous studies reporting a significant and positive influence of innovative capabilities (Nassimbeni, 2001; Dhanaraj and Beamish, 2003; Ibeh, 2003; Serra *et al.*, 2012) and marketing capabilities (Tzokas *et al.*, 2000; Serra *et al.*, 2012) on export propensity. This could be explained by the fact that, in an export context, R&D activities are likely to engender additional costs, which would then negatively impact the capital assigned to exporting and subsequently prevent the firm from going international (Rodriguez and Rodriguez, 2005). This is particularly relevant to the context in which this study took place. Exported products from African regions may not necessarily need advanced technology and innovative capabilities to be competitive (Alvarez, 2004). For instance, Algerian non-oil exports mainly constitute of agricultural and food-related products (such as fruits and vegetables) which would not require advanced technologies (ALGEX, 2014). It could therefore be argued that costs engendered by these processes are highly likely to discourage African SME managers from venturing into foreign markets. A similar explication could be given to the negative role of marketing capabilities. Developing such competencies is a costly process, which could offset its benefit (Morgan *et al.*, 2012). However, the findings also revealed that when these capabilities are coupled with export-oriented managerial resources, SMEs' probability to enter export markets tends to increase. The pairwise comparison suggested significantly greater export propensity amongst clusters involving high levels of managerial resources, alongside these capabilities (C3 and C4 in comparison with C2 and C5). This is in accordance with the extant literature. Evidence shows

that export oriented managers are dedicated to allocate sufficient resources to export activities (Sousa *et al.*, 2008), and hence, even when such capabilities involve extra costs, these will not be at the expense of exporting budget. Export oriented managers see exporting as opportunities to exploit (McNaughton and Pellegrino, 2015), rather than costs to mitigate.

In summary, it could be concluded that the possession of a combination of resource-factors is more likely to lead to export entry than single factors. In fact, none of the factors can be considered as a critical success factor. The possession of competencies such as marketing and technology, and the access to relational resources, will not necessarily lead to export entry unless combined with high managerial resources.

## **Conclusions**

The findings from the fuzzy *c*-means cluster based analysis emphasised the interplay of various types of firms' resources and capabilities and their role in enhancing SMEs' propensity to export. Such findings contribute to the RBV theory by demonstrating that, in a North-African context, the possession of resources and capabilities such as innovative and marketing factors are not necessarily drivers of SMEs' export propensity. The fuzzy *c*-means clustering has highlighted that these should be complemented by decision makers that are export oriented who have the relevant attributes in terms of export knowledge and experience. Contrary to the common understanding emerging from the export literature, marketing and innovative abilities per se could have an inverse influence on export propensity due to various costs related to their development and acquisition, it is only when complemented by managerial factors that these could enhance internationalisation. Furthermore, the findings have increased understanding regarding the role of relational resources in SMEs' internationalisation. It was found that such resources should not be considered as core resources driving SMEs' propensity to export, as due to their shared nature, such resources may lose their uniqueness and hence would not necessarily lead to a competitive advantage. Instead, relational resources should be seen as complementary assets that, with the presence of core resources and capabilities, are likely to enhance SMEs' internationalisation.

This study holds several important implications to potential exporters and export promotion organisations (EPOs) operating in North Africa. These EPOs can benefit from such findings in targeting their programmes which are known to be resource enhancers (Leonidou *et al.*, 2011). Targeting the relevant resources would be crucial in increasing the effectiveness of such programmes. Following the taxonomy provided here, EPOs can benefit from the present findings when designing their programmes. Programmes dedicated to develop

innovative and marketing capabilities, such as marketing training programmes and technology upgrade schemes, should be carefully targeted in accordance with the firm's financial abilities and the nature of the exported products. Due to their costs, developing marketing and innovative capabilities may not necessarily lead to international market entry and can instead have a negative influence on export propensity. More importantly, when offered, programmes designed to increase such capabilities should be complemented with informational sessions and workshops on exporting activities. These programmes are likely to enhance the decision makers' foreign knowledge and raise their awareness and attitudes toward exporting opportunities. This will motivate them to pursue exporting operations despite the engendered costs. Finally, EPOs should not underestimate the role of relational resources in supplementing the aforementioned assets. Although not critical, these could help enhancing export likelihood. It is therefore suggested that North African EPOs should encourage and facilitate collaborative strategies amongst peer firms at the domestic level.

In terms of limitations, the study acknowledges the following. First, while the study seeks to include a comprehensive list of resources and capabilities bundles, this list is not exhaustive. Future research may include additional factors that could act as drivers to SMEs' export entry. Second, given the scarce number of Algerian existing and potential exporters, the study includes SMEs from various manufacturing sectors. However, it is recognised that firms in different sectors may be affected by different factors and hence, the study calls for sectoral studies that may uncover such differences. Third, while it is believed that the present special issue on African entrepreneurship will advance our knowledge on SMEs' operating in this region, the authors still call for further empirical evidence from the North-African region. The current and continuous drop in oil prices stresses the imperative need to assist policy makers in this part of Africa through advanced knowledge on SMEs' international involvement.

From a methodological perspective, future thinking should also be considered in terms of identifying novel techniques to employ in this analysis, for example the fuzzy clustering undertaken here (itself can be further developed – such as imposing thresholds on membership to clusters for a case to be considered associated with a cluster). Within this form of analysis, there is also the potential to connect the clustering with other variables (control variables) in concomitant regression level analysis, something to consider in future research with understanding of pertinent control variables.

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## Appendix A: Breakdown of Survey Questions

<b>Constructs</b>
<b>Innovative Capabilities</b>
<i>Firm's Technology and Innovation</i> measured on five-point scale: 1= strongly disagree, 5=strongly agree source: Adapted from Leonidou <i>et al.</i> (2011)
<i>Technology</i> Our firm possesses unique products Our firm possesses proprietary technical knowledge <sup>a</sup> Our firm spends considerable amounts of money on R&D Our firm possesses modern production technology and equipment <sup>a</sup> Our firm possesses sufficient production capacity
<i>Innovation</i> Our firm is constantly adopting innovative marketing techniques Our firm is constantly sensing trends and competitors' movements Our firm is constantly adopting new methods in the production process Our firm is constantly developing new products
<b>Export Oriented Managerial Resources</b>
<i>Decision Maker's export knowledge and experience</i> measured on five-point scale: 1= strongly disagree, 5=strongly agree source: Adapted form Leonidou <i>et al.</i> (2011)
<i>Intellectual foreign knowledge</i> We have extensive knowledge of foreign market demand We have extensive knowledge of export regulations and paperwork We have extensive knowledge of overseas shipping and transportation practices We have extensive knowledge of foreign business practices
<i>Foreign experience</i> We have extensive overseas experience (lived/worked abroad)
<b>Relational Resources</b>
<i>Relationships quality with local businesses</i> measured on five-point scale: 1= strongly disagree, 5=strongly agree Source : Adapted from Lages <i>et al.</i> (2005) ; Ural (2009)
<i>Information sharing</i> These firms frequently discuss strategic issues with us These firms openly share with us confidential information about foreign markets These firms rarely talk with us about their business strategy <sup>r,a</sup>
<i>Communication</i> Our firm has a continuous interaction with other firms during implementation of our business strategy The strategy's objectives are communicated clearly to these firms Team members from both sides openly communicate while implementing business strategies There is extensive formal and informal communication during implementation of our business strategy
<i>Long term orientation</i> We believe that, over the long run, our relationship with these firms will be beneficial Maintaining a long-term relationship with these firms is crucial to us We focus on long-term goals in this relationship We are willing to make sacrifices to help these firms from time to time
<i>Satisfaction with relationship</i> Our association with these firms has been a highly successful These firms leaves a lot to be desired from an overall performance standpoint <sup>r,a</sup> Overall, the results of our relationship with these firms fell far short of expectations <sup>r</sup>
<b>Marketing Capabilities</b>
<i>Firm's informational capabilities</i> easured on five-point scale: 1= much worse than competitors, 5=much better than competitors source: Adapted form Kaleka (2012)

Capturing important market information
Identifying prospective customers
Acquiring market related information <sup>a</sup>
Making contacts
Monitoring competitive products
<i>Firm's pricing capabilities</i>
measured on five-point scale: 1= much worse than competitors, 5=much better than competitors
source: Adapted form Morgan <i>et al</i> (2012)
Doing an effective job of pricing the products
Using our pricing skills to respond quickly to changes in customer needs
Communicating pricing structures and levels to customers
Being creative in "bundling" pricing deals
<i>Firm's advertising capabilities</i>
measured on five-point scale: 1= much worse than competitors, 5=much better than competitors
source: Adapted from Morgan <i>et al</i> (2012)
Developing effective advertising and promotion programmes
Advertising and promotion creativity
Skillfully using marketing communications
Effectively managing marketing communications programmes
<b>Export Behaviour</b>
<i>Export Propensity</i>
measured using a dummy variable
source: Serra et al. (2012)
Does your company export or has exported in the last five years? (Yes/No)
<sup>r</sup> Reversed item
<sup>a</sup> Dropped item

## Appendix B: Exploratory Factor Analysis

<b>Rotated Component Matrix<sup>a</sup></b>				
	<b>Component</b>			
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Skilfully using marketing communications	<b>.829</b>	.193		
Advertising and promotion creativity	<b>.823</b>	.131		.108
Developing effective advertising and promotion programmes	<b>.818</b>	.103		.151
Effectively managing marketing communications programmes	<b>.817</b>	.188		
Making contacts	<b>.785</b>	.209	.132	.106
Identifying prospective customers	<b>.771</b>		.180	
Being creative in “bundling” pricing deals	<b>.751</b>	.125		
Monitoring competitive products	<b>.750</b>	.165		.170
Using our pricing skills to respond quickly to changes in customer needs	<b>.735</b>	.102		.139
Doing an effective job of pricing the products	<b>.725</b>			.192
Capturing important market information	<b>.708</b>	.114		
Communicating pricing structures and levels to customers	<b>.648</b>			.186
Our association with these firms has been a highly successful	.198	<b>.800</b>	.106	
Maintaining a long-term relationship with these firms is crucial to us	.111	<b>.796</b>		
We focus on long-term goals in this relationship		<b>.794</b>		
We believe that, over the long run, our relationship with these firms will be beneficial		<b>.787</b>		
There is extensive formal and informal communication during implementation of our business strategy	.118	<b>.751</b>	.107	.118
The strategy’s objectives are communicated clearly to these firms		<b>.738</b>		.165
Our firm has a continuous interaction with other firms during implementation of our business strategy	.164	<b>.726</b>	.110	
Team members from both sides openly communicate while implementing business strategies	.134	<b>.719</b>		.156
Overall, the results of our relationship with these firms fell far short of expectations		<b>.697</b>	.174	
We are willing to make sacrifices to help these firms from time to time		<b>.687</b>	.140	
These firms frequently discuss strategic issues with us	.197	<b>.611</b>	.118	
These firms openly share with us confidential information about foreign markets	.146	<b>.587</b>	.122	
We have extensive knowledge of overseas shipping and transportation practices		.168	<b>.860</b>	.100
We have extensive knowledge of foreign business practices			<b>.846</b>	
We have extensive knowledge of export regulations and paperwork	.184	.238	<b>.814</b>	.145
We have extensive overseas experience (lived/worked abroad)		.178	<b>.803</b>	
We have extensive knowledge of foreign market demand	.130	.225	<b>.746</b>	.189
Our firm is constantly adopting new methods in the production process	.109			<b>.771</b>
Our firm is constantly adopting innovative marketing techniques	.163			<b>.744</b>
Our firm is constantly sensing trends and competitors’ movements	.158	.112		<b>.700</b>
Our firm possesses unique products			.134	<b>.676</b>
Our firm spends considerable amounts of money on R&D	.183		.163	<b>.653</b>
Our firm possesses sufficient production capacity	.211	.152		<b>.628</b>
<b>Extraction Method: Principal Component Analysis.</b>				
<b>Rotation Method: Varimax with Kaiser Normalization.</b>				
<b>a. Rotation converged in 5 iterations.</b>				